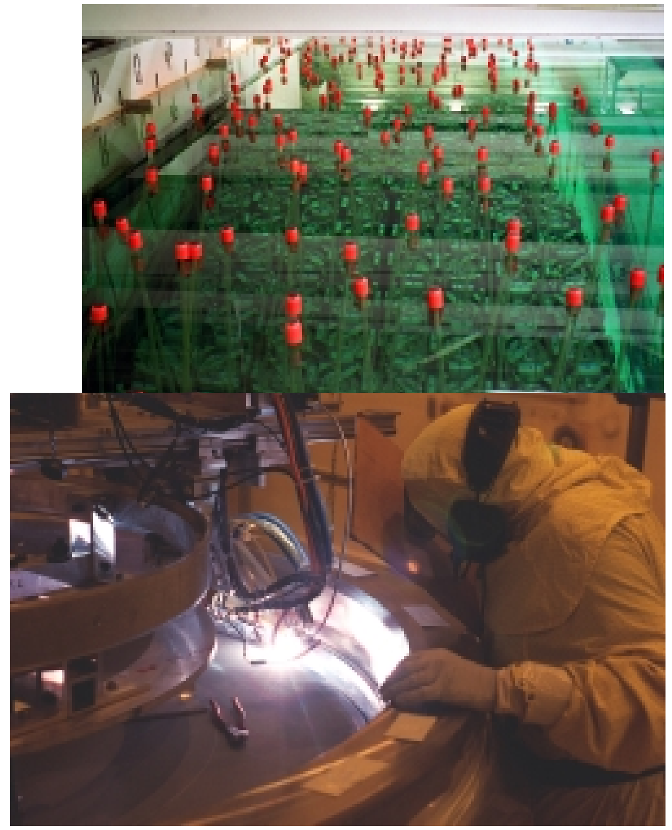
(TMI-2 continued from page 1)

dry storage module at the Independent Spent Fuel Storage Installation (ISFSI) located at the Idaho Nuclear Technology and Engineering Center. The action brought to a close a complicated 6-year effort to move all of the extensively damaged TMI core debris from an aging water pool to a new, NRC-licensed storage facility. The lengthy transfer process meant that the core debris was successfully removed from wet storage, dried, prepared for shipping, loaded, transported, and inserted into the modules.

The 1995 agreement between DOE, the U.S. Navy, and the State of Idaho laid out commitments that DOE must keep with the state regarding waste treatment and disposal, and managing spent nuclear fuel currently stored at the INEEL. Completing this project allows the INEEL to continue its national security mission of receiving spent nuclear fuel from the nuclear Navy, foreign research reactors, and other DOE sites. Under the agreement, the TMI-2 core debris had to be moved into dry storage by June 1, 2001, to await final disposal outside Idaho.

The TMI-2 project team faced numerous operational and technical challenges during the project. “Strong teamwork and effective communications drove us to success,” said Art Clark, spent nuclear fuel operations manager. Workers representing each specialty offered their unique perspective and skill at different times to creatively overcome problems.



Top: Test Area North storage pool holding TMI-2 spent fuel canisters. Bottom: Welding the Dry Shield Canister cover plate closed.

The integrated teams, working 24 hours a day, 7 days a week, controlled outcomes with deliberate management and planning tactics, aggressive equipment support, carefully staged processes, and continual communication feedback. Single-point failures were anticipated and eliminated when possible or immediately corrected.

For example, a second heated vacuum drying system was installed and a strong preventive maintenance program was implemented to ensure the reliability of cranes and other crucial equipment. Spare parts were carefully stocked to avoid delays on repairs.

Communication, teamwork, and many long hours brought the TMI-2 Dry Storage Project to an early conclusion.

Following the March 28, 1979, TMI-2 accident in Pennsylvania, the INEEL has performed a lead role in the accident analysis and recovery, core debris retrieval, transport, and safe storage. ♣

We’re on the web! http://nsnfp.inel.gov

PROVIDING SOLUTIONS FOR SAFE, EFFICIENT DISPOSITION OF DOE SPENT NUCLEAR FUEL

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NSNFP
National Spent Nuclear Fuel Program

PROVIDING SOLUTIONS FOR SAFE, EFFICIENT DISPOSITION OF DOE SPENT NUCLEAR FUEL

National Spent Nuclear Fuel Program News

Successful K Basins Fuel Removal Begins

In December 2000, the Hanford Site removed the first canister of N Reactor spent fuel from the K West Basin. This accomplishment marked a major milestone in DOE’s effort to diminish risk to the Columbia River by removing fuel and waste away from the river to the site’s Central Plateau. DOE plans to complete removal of all fuel (~2100 metric tons) from underwater storage in the deteriorating K East and K West Basins by July 2004 to comply with Hanford’s Federal Facility Agreement and Consent Order (Tri-Party Agreement), which was negotiated by DOE, the United States Environmental Protection Agency, and Washington State’s Department of Ecology.

The fuel removal operation requires several steps. The first step is the fuel retrieval, which includes fuel cleaning, sorting, and inspection. Second, the fuel is loaded into baskets. Third, the baskets are loaded underwater into a fuel canister, called a Multi-Canister Overpack (MCO), within an onsite

(K Basins continued on page 2)

Three Mile Island—2 Fuel Debris Move into Dry Storage Completed Ahead of Schedule

The Idaho National Engineering and Environmental Laboratory (INEEL) completed safe transfer of Three Mile Island (TMI) Unit 2 core debris from Test Area North wet pools to safe dry storage. This DOE commitment to the State of Idaho was achieved 6 weeks ahead of schedule.

On April 20, INEEL employees inserted the last of 29 canisters containing TMI-2 spent nuclear fuel core debris into a horizontal

(TMI-2 continued on page 6)

Trailer carrying the OS/197 shipping cask is carefully aligned to push the dry shielded canister into a NUHOMS® spent fuel storage module at the Independent Spent Fuel Storage Installation.

Inside this issue:

Providing:

- *Solutions for safe, efficient packaging and transportation*
- *Solutions for safe interim and long-term storage*
- *Solutions for accurate characterization*
- *Compliance with safety and regulatory requirements.*

(K Basins continued from page 1)

transfer cask. And the last step is the removal of the transfer cask from the K Basins and transfer to the Cold Vacuum Drying (CVD) Facility. There, water is removed from the MCO followed by low-temperature vacuum drying and inerting while still inside the cask. The cask is transferred to the Canister Storage Building (CSB) where the MCO is removed and placed in an interim storage tube.

First transfer cask shipment departing from the K West Basin.

These fuel removal operations required major K West Basin modifications, construction of the CVD Facility and the CSB, and acquisition of cask transport systems and fuel canisters.

The K West Basin modifications included installing an integrated water treatment system, a fuel retrieval system, and a cask loadout system. CVD Facility construction included installing two process drying skids. CSB construction included installing a 450-ton MCO handling machine and outfitting the first of the CSB's three storage vaults with 220 storage tubes, which extend 40 ft beneath the CSB's 5-ft-thick concrete floor. Five transport casks were fabricated to support concurrent fuel removal operations at the K Basins, CVD Facility, and CSB. Four hundred MCOs with associated baskets are being fabricated for the K Basins fuel inventories.

Several key technical issues were resolved before determining that the fuel could be safely dried using the CVD process and stored under planned conditions at the CSB. In addition, a major test program was conducted at each facility to demonstrate system performance, while providing crucial training to operators, health physics technicians, engineers, and managers.

Successfully achieving the many technical, construction, and test objectives has proved that the fuel removal operations can effectively proceed on a rigorous, aggressive schedule. By mid-May, the ninth MCO was loaded, processed at the CVD, and placed in interim storage at the CSB. ♣

NSNFP 2001 MEETING SCHEDULE

DATE	MEETING TITLE	LOCATION	CONTACT
June 17-21	American Nuclear Society Annual Meeting (One session on DOE SNF)	Milwaukee, WI	American Nuclear Society
June 26-27	National Spent Nuclear Fuel Program Semiannual Strategy Meeting	Idaho Falls, ID	Philip Wheatley, pdw@inel.gov
July 15-19	Institute of Nuclear Materials Management Annual Meeting	Indian Wells, CA	James Linhart 702-295-0366
September	Training, Research, and Test Reactors Conference	Tahoe, CA	Jay Thomas 803-557-6402
September 3-7	Institute of Nuclear Materials Management PATRAM* Symposium	Chicago, IL	www/patram.org
October	Reduced Enrichment for Research and Test Reactors Conference	Bali, Indonesia	Jay Thomas 803-557-6402
Nov 11-15	American Nuclear Society Winter Meeting	Reno, NV	American Nuclear Society

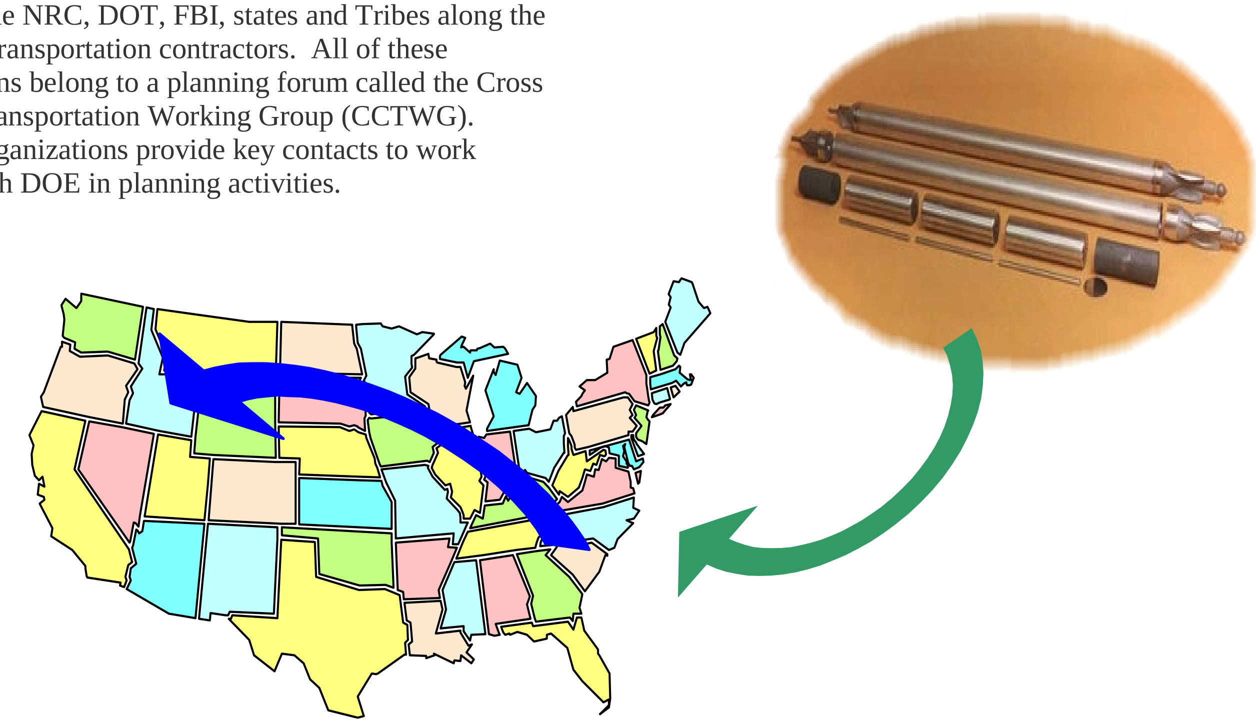
Third Cross-Country Shipment Planned for Spring – Summer 2001

Savannah River Site (SRS) personnel in the Foreign Research Reactor Spent Nuclear Fuel Acceptance Program are making preparations for the third cross-country shipment of Training, Research, Isotope, General Atomics (TRIGA) spent nuclear fuel to the INEEL. TRIGA Fuel is a solid uraniun-zirconuim hydride alloy clad with either stainless steel, aluminum, or INCOLOY (a nickel-iron-chromium alloy). The INEEL is the designated DOE site for consolidation of ~1 ton of this material until final disposition. Approximately two TRIGA shipments per year are scheduled until the end of the program in 2009.

Cross-country shipment planning starts years in advance and involves a multitude of organizations including DOE-SR, DOE-ID, DOE-HQ, the National Transportation Program, the NRC, DOT, FBI, states and Tribes along the route, and transportation contractors. All of these organizations belong to a planning forum called the Cross Country Transportation Working Group (CCTWG). Member organizations provide key contacts to work directly with DOE in planning activities.

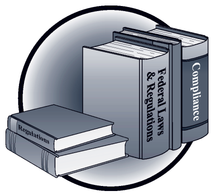
The 1999 TRIGA cross-country shipment consisted of five casks of spent nuclear fuel from research reactors in Germany, Italy, Slovenia, and Romania. The 2000 TRIGA shipment consisted of one cask from the United Kingdom. Both arrived via the Charleston Naval Weapons Station and were safely transported to SRS and then on to the INEEL. The 2001 cross-country shipment is planned to consist of three casks from Germany.

The goal of the Research Reactor Spent Nuclear Fuel Program is to support United States nuclear nonproliferation objectives by reducing and working to eliminate the use of weapons-usable uranium. ♣



The National Spent Nuclear Fuel Program Semiannual Strategy Meeting

This summer's NSNFP Semiannual Strategy Meeting will be held Tuesday and Wednesday, June 26–27, 2001, in Idaho Falls at the University Place Center for Higher Education Building, 1170 Science Center Drive. The goal of the meeting is to address those issues that are key to accomplishing the overall DOE spent nuclear fuel mission. Along with the technical and strategy sessions, we will enjoy an Idaho Dutch oven cookout on the evening of June 26.



Analyses Ensure That DOE Spent Nuclear Fuel Is Included In the Repository Site Recommendation and License Application

The NSNFP, working closely with the DOE sites, continues to make progress in preclosure and postclosure analyses to ensure DOE spent nuclear fuel (SNF) is part of the repository Site Recommendation and License Application. The NSNFP has continued preclosure design basis events (DBE) and postclosure criticality and total system performance assessment (TSPA) analyses to support the repository Site Recommendation process. This information will eventually be used in the repository license application process.

The DBE includes the following activities:

- Identify potential off-normal events during receipt, handling, packaging, and emplacement of DOE SNF at the repository
- Perform the necessary frequency and consequence calculations for these events
- Identify facility design requirements necessary to prevent or mitigate consequences of DOE SNF design basis events.

Scoping analysis using extremely conservative assumptions such as 100% particulate, no credit for canister confinement, and no filtration resulted in unacceptable site boundary dose consequences for only 20% of the DOE SNFs. To address that 20%, the NSNFP and DOE Office of Civilian Radioactive Waste Management (RW) initiated efforts to pursue an integrated performance allocation between the monitored geologic repository systems and the standardized DOE SNF canister (and multi-canister overpack).

DOE-owned SNF refers only to that SNF for which the U.S. Department of Energy Office of Environmental Management has responsibility, excluding naval fuels, which are the responsibility of the Naval Nuclear Propulsion Program.

(Analyses continued on page 4)

Status of DOE-owned SNF criticality analyses inside the waste package

DOE SNF Group	Representative Spent Fuel	Status
Mixed oxide fuel	FFTF driver fuel assembly	Completed
U-Mo and U-Zr alloys	Enrico Fermi fuel	Completed
HEU oxide	Shippingport PWR fuel assembly	Completed
U-Zr-Hx	TRIGA-FLIP fuel	Completed
U-233/Th oxide	Shippingport LBWR driver fuel assembly	Completed
HEU-Al	Melt and dilute form	To be completed FY-01
LEU metal	N-Reactor fuel	Completed
LEU oxide	TMI fuel	If needed, FY 03
U/Th carbide	FSV fuel assembly	To be completed FY-01

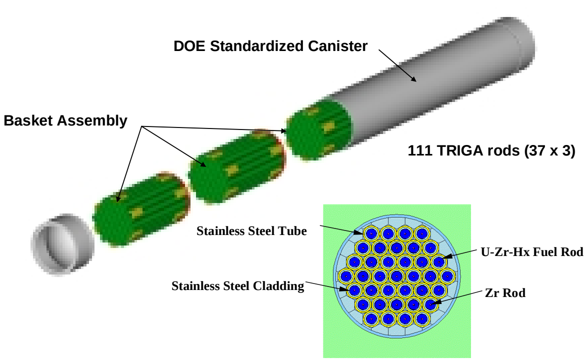
(Analyses continued from page 3)

The integrated performance allocation is the performance level shared or allocated between the DOE canisters and the monitored geologic repository handling facility that ensures any releases from a credible DOE SNF design basis drop and breach event would result in doses that are below the regulatory limit.

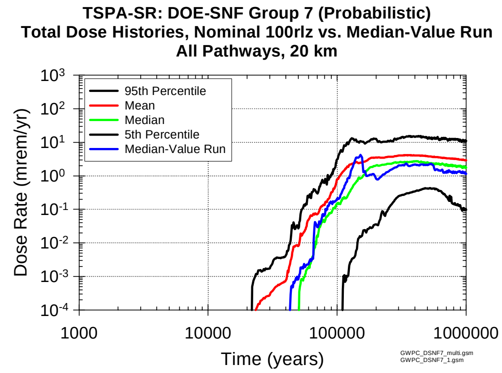
Based on this performance allocation, the NSNFP has demonstrated by a series of drop tests and technical analyses that the standardized DOE SNF canister can survive a credible design basis drop event without a breach of the containment. The multi-canister overpack design will be analyzed in FY 2002 or FY 2003 using a similar credible design basis drop event.

NSNFP and RW are performing postclosure criticality activities to demonstrate the viability of DOE-owned SNF for repository disposal. Engineers are using the same disposal criticality analysis methodology as used for commercial SNF. The methodology evaluates potential critical configurations from intact through degraded, and analyzes the geochemical and physical processes that can breach the waste package, degrade the DOE SNF, and transport it to the environment.

NSNFP placed over 250 DOE SNF types into nine representative groups based on fissile content and specific fuel material for the criticality analyses. To date, analyses are complete for configurations inside the waste packages for six of the nine fuel groups. Criticality analyses external to the waste package are in progress and will be completed in FY 2002.



TRIGA fuel basket design. One example of the fuels and configurations that are being analyzed.



TSPA-SR probabilistic dose histories as compared to the medium value dose histories for DOE SNF Group 7 U-metal fuel.

The calculation of probability and consequence presents the greatest remaining challenge for the repository license application. NSNFP and RW will validate reports and design analyses in FY 2002 and FY 2003.

Similarly, postclosure TSPA analyses are ongoing to demonstrate the performance of DOE-owned SNF after repository closure . NSNFP and RW conducted numerous performance assessment and sensitivity analyses to ensure that DOE SNF is included in the proposed repository Site Recommendation and License Application. They are using the most current TSPA model as the basis for the calculations. To date, analyses are complete on DOE SNF using the TSPA-1995, TSPA-Viability Assessment, and TSPA-Site Recommendation models.

TSPA analyses will continue using the TSPA-License Application model to update prior TSPA calculations and for dose analyses of the pyrophoric event, using EQ3/6 (a geochemical code) for the analysis of spent fuel and HLW interactions in a failed codisposal package, and using NUFT (a thermal hydrology code) for the thermal analyses of the pyrophoric event. ♣